ARAC ETOPS WORKING GROUP

Concept Briefing

December 13, 2000

Introduction

In accordance with the ARAC ETOPS Working Group task statement of June 14, 2000 (65FR37447), and the working group's work plan approved by the ARAC Air Carrier Operations Issues Group on August 15, 2000 (attached), the ETOPS WG has reviewed existing ETOPS documents and developed a risk assessment method for ETOPS and other long range flights. Our risk assessment method is comprised of three parts: a loss of thrust model; a system safety analysis using the FAR/JAR 25.1309 process; and an operational assessment assuring that pertinent operational considerations are taken into account.

General Concept

Underlying our proposals for new regulations and advisory material are the following general concepts:

- Special considerations for long range flights are designed to prevent the need for a diversion and to protect the diversion when it cannot be prevented
- Airplanes must be designed and built for the intended mission
- Airplanes so designed and built must be maintained at a level that preserves the original reliability
- At some level of engine reliability, as measured by the In Flight Shut Down (IFSD) rate (.01 per 1000 engine flight hours for twins), the risk of independent failures leading to loss of all thrust ceases to limit the operation, and other limiting factors come into play
- ETOPS will continue to be defined as flights more than 60 minutes up to 180 minutes from a suitable airport in FAR Part 121 operations, while LROPS (Long Range Operations) will be defined for all operations in excess of 180 minutes from a suitable airport
- Part 135 operations have unique considerations

Topics for Proposed Regulations and Guidance Material

Accordingly, the ETOPS Working Group will propose regulations and/or guidance material in three specific areas: Type Design (Parts 25 and 33); Part 121 Operations; and Part 135 Operations.

Handout 14

121 Concept Briefing

Operational definitions will be developed.

ETOPS begins at 60 minutes.

- 75 minutes in Benign area concept will be retained.
- Criteria for exceptions, exclusive of MMEL, will be developed for up to 90 minutes for specified requirements.

ETOPS up to 180 minutes will be codified using the existing AC120-42A, and modified as appropriate.

- ETOPS diversion limits will be specified on the required flight documentation.
- Enroute alternate criteria will be reviewed to include passenger facilities appropriate to the operations.

LROPS applies to all airplanes (2, 3, & 4 engine) beyond 180 minutes and will be codified into regulations and advisory material.

- LROPS will be based on specific engine reliability standards to be developed.
- Human factors will be considered.
- Regulatory authority approval will be based on the operator, airplane equipment, and routes to be flown.
- Appropriate MMEL requirements will be developed for LROPS.
- Consideration will be given for previous operator experience.
- Current regulatory standards for operational validation will apply to LROPS.
- OPSPECS approval will be required.
- Current ETOPS maintenance practices will be carried over into LROPS for twins.
- Maintenance practices and standards for 3 & 4 engine LROPS will be developed using ETOPS maintenance practices and procedures as guidelines.
- LROPS areas of operations will be defined.
- Current ETOPS performance standards will be validated and refined. LROPS performance standards will be developed.
- Pilot and dispatcher training requirements for international operations will be established with appropriate advisory material developed.
- LROPS diversion limits will be specified on the required flight documentation.

- Enroute alternate criteria will be developed to include RFFS and passenger facilities appropriate to the operations.
- Develop or revise OPSPECS weather criteria for alternate airport selection.
- Current ETOPS operational control standards and procedures may be extended and will be reviewed for LROPS.
- Appropriate standards for fuel and oil supply for LROPS will be developed.
- Current communication and navigation standards will be reviewed and applied to the appropriate area of operation.

ETOPS/LROPS Type Design Rules and Advisory Material Concepts

- Basic Safety Objectives
  - Preclude Diversion
  - Protect Diversion
- Additional Safety Objectives
  - Preserve safety level of current ETOPS
  - Apply consistent safety objectives to all LROPS aircraft

ETOPS/LROPS Type Design Rules and Advisory Material Concepts

- Objectives
  - Risk Assessment Method
  - Codify ETOPS material
  - Define LROPS requirements
  - Provide adequate advisory material

ETOPS/LROPS Type Design Rules and Advisory Material Concepts

Risk Assessment Method

Elements:

- Review of multiple risk models concluded that an 0.01/1000 engine hours IFSD rate for twins effectively eliminates loss of thrust for independent causes as an operational limitation for LROPS.

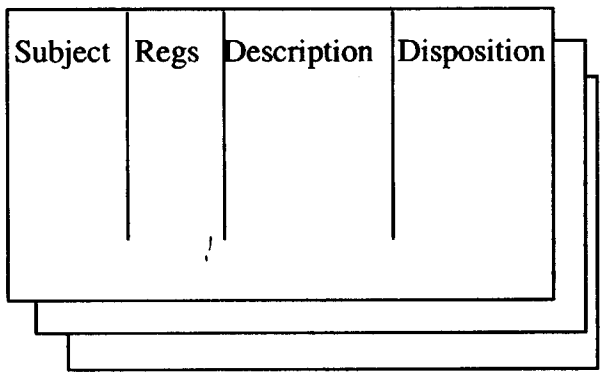
- Review of common cause/cascading failures events being conducted to define LROPS design/maintenance/operational requirements

- System safety analyses (SSA) are adequate as long as the ETOPS/LROPS mission is considered. SSA must also consider various allowable dispatch configurations, separate criteria needs to be established.

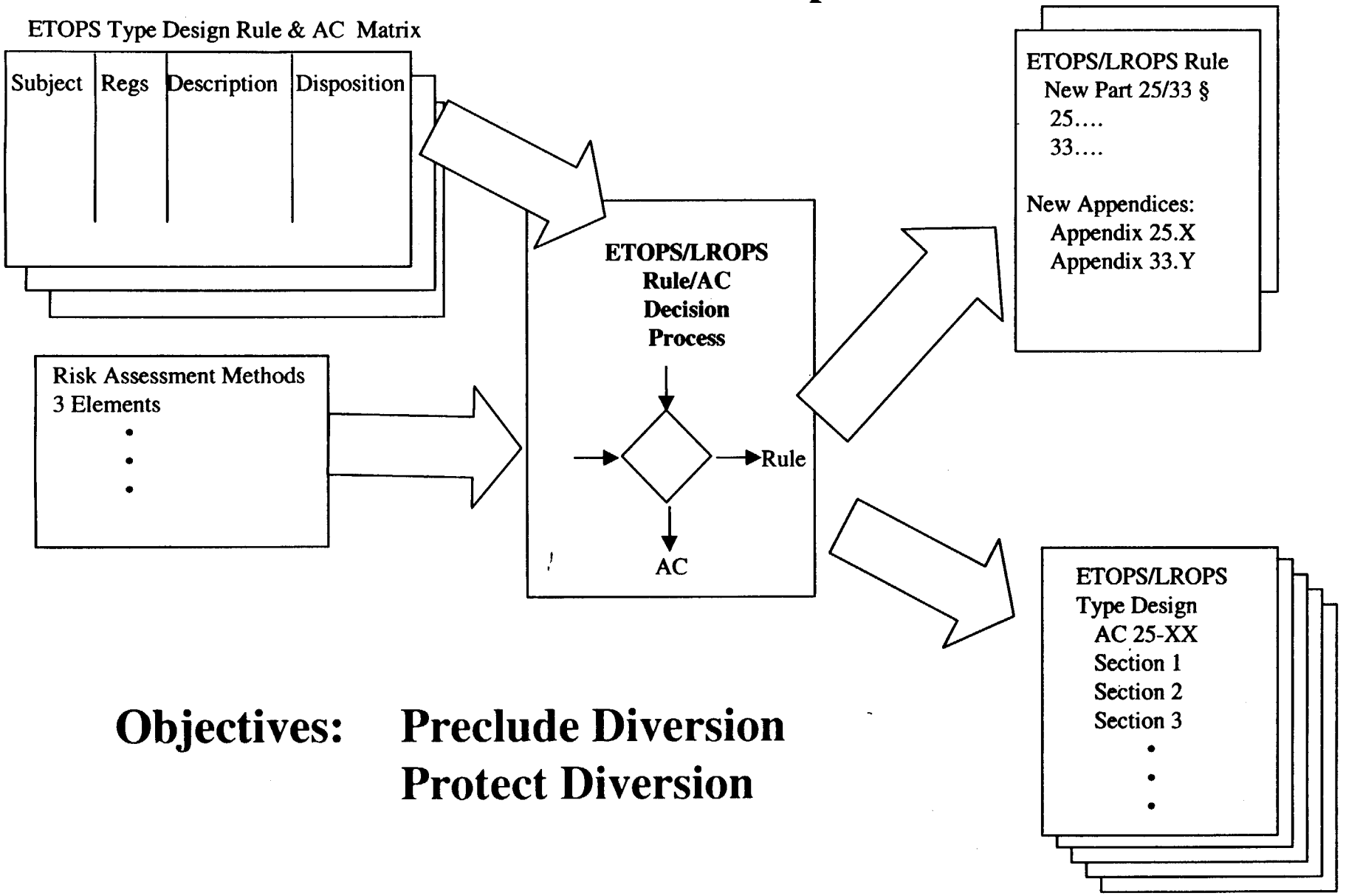
ETOPS/LROPS Type Design Rules and Advisory Material Concepts

- Codify ETOPS material

ETOPS Type Design Rules & AC Matrix



ETOPS/LROPS Type Design Rules and Advisory Material Concepts



Objectives: **Preclude Diversion**
Protect Diversion

ETOPS/LROPS Rule Decision Process

Rule Criteria

- Performance based

- Provide high level requirements that do not dictate one specific design

- Will stand the test of time

- Proposal structured similar to autoland or automatic take off thrust control system certification
    - Separate approval beyond basic Part 25 & 33 Certification
    - Requirements detailed in appendices to both Part 25 & 33

ETOPS/LROPS Advisory Circular Development

AC Criteria

- Provide acceptable means of compliance consistent with previously acceptable means

- Provide sufficient detail to ensure consistent compliance from applicant to applicant

- Address all relevant past ETOPS advisory material

- Provide historical perspective of requirements

- Provide rationale for granting LROPS approval

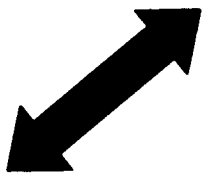
ETOPS/LROPS Rules and Advisory Circular Linkage

Part 25
Appendix 25.X:

X25.1 General
X25.2 Definitions
X25.3 Safety Assessment
- Propulsion
- Airplane Systems

X25.4 Design Validation
- In service experience
- Analysis and test
- Maint/Ops procedures

X25.5 Risk Management



Part 33
Appendix 33.X

AC 25/33.XX

1. Purpose
2. Cancellation
3. Applicability
4. Related Documents
5. Background
6. Safety Assessment
7. Design Validation
   - 7.a. Validation using in-service experience
   - 7.b. Validation using analysis and test
   - 7.c. Validation of Maint/Ops procedures
8. Risk Management
9. Type Design Certification

Appendix 1 Risk Model
Appendix 2 Propulsion Reliability
Appendix 3 ETOPS/LROPS Significant Systems

135 Concept Briefing
December 7, 2000

1. **NPRM Rule 135**:
    a. Require operations of turbine-powered airplanes within 180 minutes of an adequate airport,
    b. Specify a simple method for converting 180 minutes to a distance
    c. Require SMLROPS operators to report all power loss events, including instances when the engine is not shutdown.

2. **NPRM 135 Appendix** "K"– Rule describes the conditions & circumstances under which the Administrator would approve turbine-powered airplane operations beyond 180 minutes.

3. **Advisory Circular**
    a. Preamble/General
        i. Background
            1. This AC describes best practices for flying long distances
            -- Acceptable means, but not the only means.
            2. Recommendations in this AC are SMLROPS
        ii. Philosophy
            1. Reducing risk arising from any cause – not limited to aircraft systems or engine failure
            2. Other considerations
        iii. Applicability
            1. Advisory material for Part 135 operations beyond 180 minutes
            2. Any airplane, regardless of number of engines

    b. Definitions:
        i. Unique name (SMLROPS) for Part 135 operation beyond 180 minutes (LROPS as used in 121 could be confusing)
        ii. Option – to have as a subset of LROPS with 135 specific issues

    c. Operator recommendations
        i. Previous experience with long-range operations
            1. New-aircraft considerations
                a. Flight crew training
                b. Gaining service experience
                c. Alternate proving method
            2. New-Operator considerations
                a. Flight crew training
                b. Additional management oversight
                c. Describe appropriate ways to gain operational experience

ii. Additional vigilance required
    1. Maintenance procedures
    2. Maintenance training
    3. Engine condition monitoring
    4. Critical system monitoring

d. Recommended aircraft configuration
    i. Systems – i.e. Communication
    ii. Equipment – i.e. SatCom

e. Fuel/Oil Recommendations
    i. Fuel/oil requirements at departure, including reserves for:
        1. Possible engine failure or depressurization at the most critical point,
        2. Uncertainty of longer-term terminal and enroute weather forecasts
        3. Uncertainty of enroute wind forecasts overwater
        4. Possible navigational inaccuracy

f. Additional oxygen requirements for crew and passengers
    i. Impact of oxygen availability on fuel planning
    ii.

g. Additional maintenance procedures
    i. Additional pre-departure checks
    ii. Unique procedures for scheduled/routine/recurring maintenance
    iii. Unique servicing procedures

h. Additional pilot procedures
    i. Additional flight-planning recommendations
        1. Enroute diversion airport requirements
        2. In-flight communication capabilities for WX/airfield updates
        3. Additional pre-departure checks

    ii. Inflight situational awareness
        1. Location of nearest enroute diversion (ETP) airport
        2. Redundant enroute checks of fuel use / fuel remaining